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Department of Public Works
J. J. Callahan, Commissioner

U. S. Department of the Interior
Geological Survey
W. E. Arather, Director

✓
Cooperative Geologic Project

Geologic Interpretation of Seismic Data

Relocation Route 2

Littleton Road Grade Separation

Stations 243-252

in Harvard, Mass.

by

James E. Maynard, Geologist, U. S. Geological Survey

and

Rev. Daniel Linehan, S. J., Seismologist, Weston College

4 pages of text
2 plates ✓



Seismic Series# _____

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General Statement

During parts of June and July 1949 nine seismic traverses were made at this site. Upon preliminary office development, the velocity data for some of these traverses were thought to be inadequate and it was recommended that these lines be re-surveyed. Later surveys (March 1950), however, of nearby sites indicated that the original data were reliable and that a re-survey was unnecessary.

The work was done as part of a cooperative program of the Massachusetts Department of Public Works and the United State Geological Survey.

Surface Geology

At this location the proposed roadside traverses a nearly horizontal, bench-like area on the northern slope of a till hill. Where sampled the till is moderately loose, somewhat sandy, and is overlain

by a thin layer, a few inches to a few feet thick, of fine silt and sand. At the overpass site numerous boulders of contorted mica schist are scattered over the surface. Many large angular blocks of granite and related rock, however, occur just to the west of the overpass site between stations 240+50 and 243.

The bedrock underlying most of the site is probably mica schist, for this type of rock, with a trend that would project to the site, is exposed along Littleton Road several hundred feet to the east of the overpass site. In addition, a small mass of mica schist, that is probably in place, occurs 45 feet from G, along traverse G-H. The geology of the site and of the surrounding region strongly suggest that bedrock is close to the surface at this location.

Seismic Traverses

The layout of the seismic traverses is shown on sheet 1. The traverses and their lengths are:

A-B,	330 feet	I-J,	165 feet
B-C,	330 "	K-L,	165 "
D-E,	220 "	M-N,	165 "
E-F,	220 "	P-Q,	165 "
G-H,	165 "		

The shot points for the traverses were located as follows:

A,	station 251+30						
B,	" 248+00						
C,	124 feet to the right (south)	of station	244+95				
D,	90 " " " left (north)	" "	248+05				
E,	5 " " " " " "	" "	248				
F,	station 243+80						
G,	50 feet to the " " " "		243+57				

H,	station	247				
I,	65 feet to the right (south) of station	248+25				
J,	station	248+25				
K,	35 feet to the	"	"	"	"	248+75
L,	35	"	"	"	"	247+10
M,	20	"	"	left (north)	"	249+35
N,	20	"	"	"	"	247+70
P,	105	"	"	right (south)	"	250+00
Q,	60	"	"	left (north)	"	250+00

Depths to Bedrock

The depths to bedrock at the shot points as calculated from the seismic data are as follows:

A -	4 feet	I -	11 feet
B -	7 "	J -	9 "
C -	5 "	K -	7 " (estimate)
D -	5 "	L -	10 "
E -	10 "	M -	8 "
F -	8 "	N -	9 "
G -	5 "	P -	7 "
H -	8 "	Q -	13 "

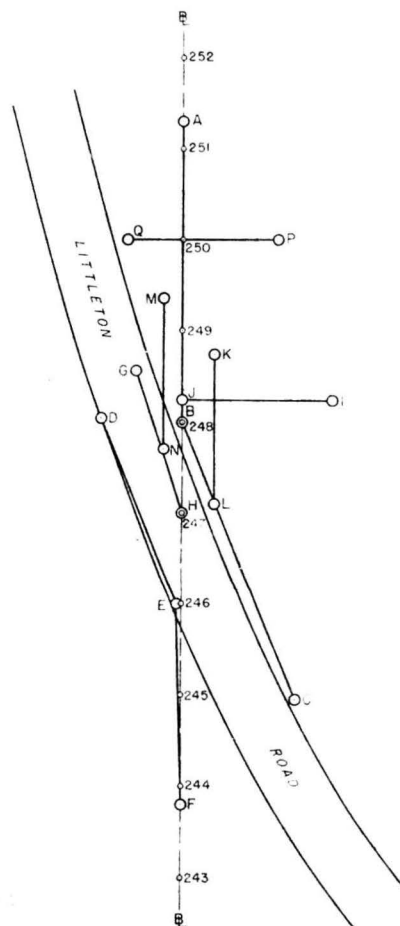
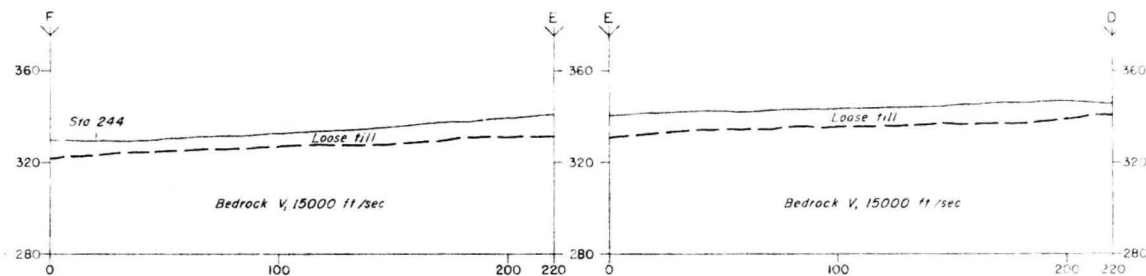
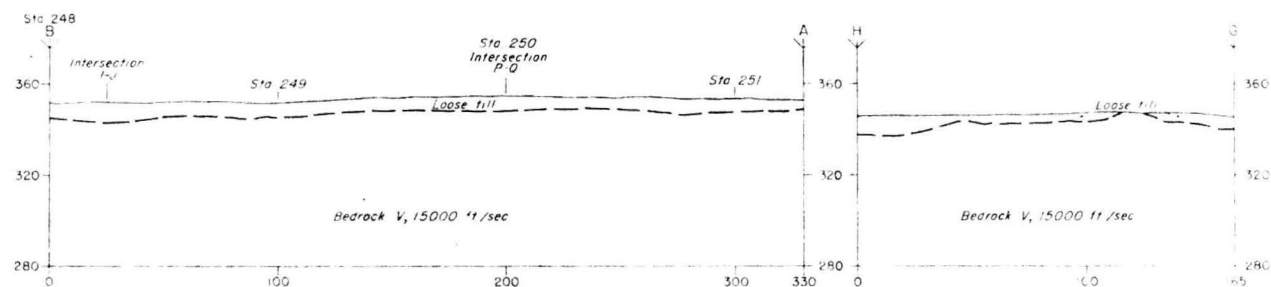
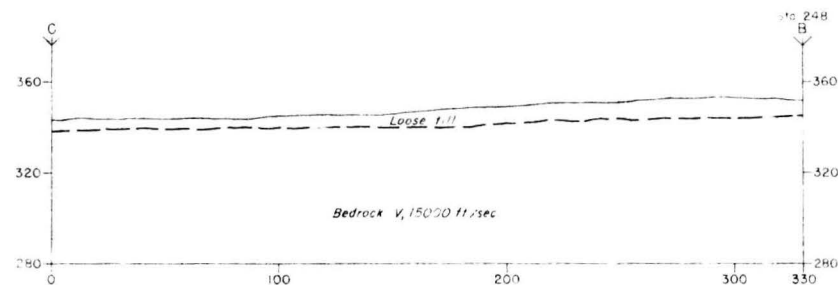
Geologic Interpretation of Seismic Data

The interpreted positions of the bedrock surfaces along the seismic traverses between the shot points are shown on the geologic sections, sheet 2. These surfaces are shown on the sections by smooth curves, but they must be considered only as generalized approximations, for many small ridges, knobs, and depressions may occur at altitudes that are above and below these curves.

The depth values for most of the shot points were calculated from an estimated average till velocity of 2500 feet per second. From experience elsewhere, however, this estimated velocity is believed to be

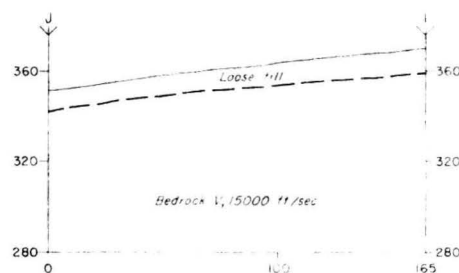
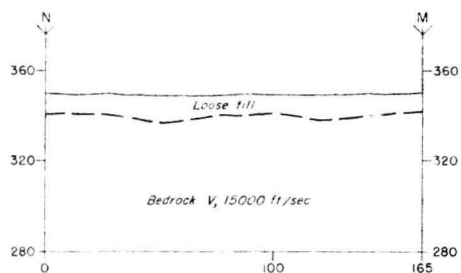
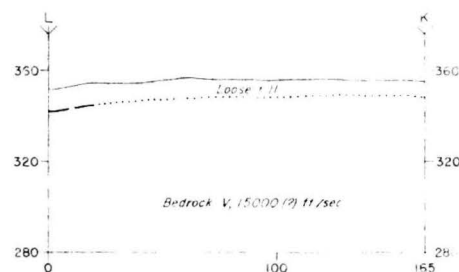
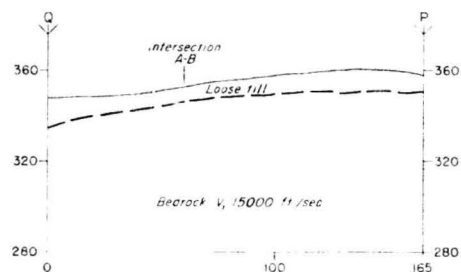
very close to the actual velocity of the material, so that the depth values and general altitudes of the bedrock profiles can be considered reasonably reliable.

Most of the velocity data for traverse L-K were confused and inadequate. The position of the bedrock surface for most of this section is dotted, with the depth value at K being only a rough estimate. The depth value at L may be considered good, but, in general, the information given by this section must be considered only as a very rough approximation.



PLAN OF TRAVERSES
SCALE: 1 INCH = 100 FEET
Letters refer to shot points at ends of traverses. Numbers refer to D.P.W. stations on baseline.

INTERPRETATIVE GEOLOGIC SECTIONS ALONG SEISMIC TRAVERSES	
HARVARD	ROUTE NO 2
RELOCATION STAS 243-252 (LITTLETON ROAD GRADE SEPARATION)	
SCALE: 1 INCH = 40 FEET	GEOLOGY BY JAMES E. MAYNARD
↓ Shot point	SEISMIC DATA BY DANIEL LINEHAN, S.J.
V Apparent seismic velocity (ies) in feet per second	ENGINEERING BY W. H. STEAD
DATE: JUNE-JULY, 1949	SHEET 1 OF 2



PLAN OF TRAVERSES	
SCALE: 1 INCH =	FEET
Letters refer to shot points at ends of traverses.	

NOTE:
Dotted portions of sections indicate
inconclusive seismic data

INTERPRETATIVE GEOLOGIC SECTIONS ALONG SEISMIC TRAVERSES	
HARVARD	ROUTE NO 2
RELOCATION STAS. 243-252 (LITTLETON ROAD GRADE SEPARATION)	
SCALE: 1 INCH = 40 FEET	GEOLOGY BY JAMES E. MAYNARD
SP Shot point	SEISMIC DATA BY DANIEL LINEMAN, S. J.
V _p Apparent seismic velocity (ft/sec)	ENGINEERING BY W. H. STEAD
DATE: JUNE, JULY, 1949	SHEET 2 OF 2